

## WHAT IS CLAIMED IS:

1. A vertical sublimation apparatus, comprising:
  - a sublimation channel body;
  - a material rack for storing materials that will be evaporated;
  - a heating evaporation device surrounding an evaporation pipe to control heating temperatures according to different materials for evaporating said materials;
  - a condensation device surrounding the upper part of said sublimation channel body for controlling condensation temperatures required by different evaporated materials;
  - an incubating device for maintaining the temperatures of both the vapor channel and end products; and
  - a product scratching device.
2. The vertical sublimation apparatus as claimed in claim 1, wherein the structure of said material rack comprises a plurality of rails and fixed rings, said rails being fixed by two fixed rings and being located in said evaporation pipe for storing materials ready to be evaporated.
3. The vertical sublimation apparatus as claimed in claim 1, wherein said incubating device comprises a vapor channel incubating device and a product incubating device, said vapor channel incubating device surrounding an outlet port of said vapor channel to maintain the temperature of the sublimated vapor and transporting said sublimated vapor continuously into said sublimation channel body.
4. The vertical sublimation apparatus as claimed in claim 3, wherein said product incubating device surrounds the lower part of said sublimation channel body to

avoid accumulation of said sublimated vapor.

5. The vertical sublimation apparatus as claimed in claim 1, wherein said product scratching device comprises a central axis for shifting up and down and/or rotating said product scratching device, fixed rings, central support, and sawtooth.
6. The vertical sublimation apparatus as claimed in claim 5, wherein said sawtooth is located near said fixed rings beneath said central support for scratching off condensed products from the wall of said sublimation channel body.
7. The vertical sublimation apparatus as claimed in claim 1, wherein said lower part of said sublimation channel body is formed as a product storage tank for collecting said condensed products falling therein after being scratched off by said scratching device.
8. The vertical sublimation apparatus as claimed in claim 1, further comprising heat shield devices made of quartz wool and located at two ends of said sublimation channel body with one end of said evaporation pipe being further away from said sublimation channel body for maintaining a certain temperature inside said sublimation apparatus.
9. The vertical sublimation apparatus as claimed in claim 1, further comprising sealing caps located at each end of said channels having heat shield devices placed therein and locked by O-rings to prevent vacuum leakage.
10. A horizontal sublimation apparatus, comprising:
  - a sublimation channel body;
  - a material carrier located inside said sublimation channel body for storing materials ready to be evaporated;

a heating evaporation device surrounding an evaporation pipe to control heating temperatures according to different materials for evaporating said materials;

an end pipe mounted respectively at two ends of said sublimation channel body with one said end pipe connecting to a vacuum air extracting system and the other said end pipe being sealed; and

a pipe-end sealing device for connecting two ends of said sublimation channel body to said two end pipes for achieving preferable sealing effect of said sublimation channel body.

11. The horizontal sublimation apparatus as claimed in claim 10, wherein material carrier can be in the shape of a boat, a tank, a circular plate or any other forms that can be used to store materials.

12. The horizontal sublimation apparatus as claimed in claim 10, wherein said pipe-end sealing device is a screw nut.

13. A vapor collection device, comprising:

a collecting bottle filled with wires for expanding the contacting surface between vapor and cold temperature;

an inlet pipe for connecting with said vacuum sublimation purification apparatus, such that uncondensed vapor can be guided into said collecting bottle; and

an exhaust pipe for connecting with said vacuum extraction system.

14. The vapor collection device as claimed in claim 13, wherein said vapor collection device is disposed between said sublimation channel body and said vacuum system for condensing said uncondensed vapor via low temperature, thus preventing said vacuum pump from being contaminated.

15. A vacuum sublimation purification process applied to said vertical sublimation purification apparatus of claim 1, comprising the following steps:
- placing materials on said material rack;
  - turning on said vacuum extraction device to vacuum;
  - turning on said heating evaporation device to achieve the required sublimation temperature of materials;
  - turning on all incubating devices to maintain the condensation temperature;
  - scratching and collect products at a regular time interval during the evaporation process; and
  - cooling down the temperature after evaporation is completed and take out products from said product storage tank.
16. The vacuum sublimation purification process as claimed in claim 15, wherein conditions of sublimation required for purifying  $\text{Alq}_3$  are: evaporation temperature being  $350\sim 450^\circ\text{C}$ , condensation temperature being  $250\sim 350^\circ\text{C}$ , evaporation temperature being  $50\sim 100^\circ\text{C}$  higher than condensation temperature, and system pressure being  $1\sim 1\times 10^{-6}$  mbar.
17. The vacuum sublimation purification process as claimed in claim 15, wherein conditions of sublimation for purifying NPB are: evaporation temperature being  $250\sim 350^\circ\text{C}$ , condensation temperature being  $150\sim 250^\circ\text{C}$ , evaporation temperature being  $30\sim 80^\circ\text{C}$  higher than condensation temperature, and system pressure being  $0.1\sim 1\times 10^{-6}$  mbar.
18. The vacuum sublimation purification process as claimed in claim 15, wherein conditions of sublimation for purifying CuPc are: evaporation temperature being  $500\sim 650^\circ\text{C}$ , condensation temperature being  $400\sim 500^\circ\text{C}$ , evaporation temperature being  $50\sim 100^\circ\text{C}$  higher than condensation temperature, and system pressure being  $0.1\sim 1\times 10^{-6}$  mbar.

19. A vacuum sublimation purification process applied to said horizontal sublimation purification apparatus of claim 10, comprising following steps:
- placing materials in said material carrier;
  - placing said material carrier at said center of said sublimation channel body;
  - tightening up and seal said two endpipes;
  - turning on said vacuum device to vacuum;
  - turning on said heating evaporation device to control said temperature between said center and said two ends of said sublimation channel body; and
  - cooling down said temperature and break said vacuum after evaporation is completed, then scratch and collect products.
20. The vacuum sublimation purification process as claimed in claim 16, wherein conditions of sublimation for purifying  $\text{Alq}_3$  are: evaporation temperature being  $350\sim 450^\circ\text{C}$ , condensation temperature being  $250\sim 350^\circ\text{C}$ , evaporation temperature being  $50\sim 100^\circ\text{C}$  higher than condensation temperature, and system pressure being  $1\sim 1\times 10^{-6}$  mbar.
21. The vacuum sublimation purification process as claimed in claim 16, wherein conditions of sublimation for purifying NPB are: evaporation temperature being  $250\sim 350^\circ\text{C}$ , condensation temperature being  $150\sim 250^\circ\text{C}$ , evaporation temperature being  $30\sim 80^\circ\text{C}$  higher than condensation temperature, and system pressure being  $0.1\sim 1\times 10^{-6}$  mbar.
22. The vacuum sublimation purification process as claimed in claim 16, wherein conditions of sublimation for purifying CuPc are: evaporation temperature being  $500\sim 650^\circ\text{C}$ , condensation temperature being  $400\sim 500^\circ\text{C}$ , evaporation temperature being  $50\sim 100^\circ\text{C}$  higher than condensation temperature, and system pressure being  $0.1\sim 1\times 10^{-6}$  mbar.